Abbreviations and Symbols

Information on purity and application

▷	see
[ ]	Chemical Abstracts Registry Number (CAS)
>	more than
<	less than
min	minimum
max	maximum
µm	0,001 mm
~	approximate
$[\alpha]_D^{20}$	specific rotation
+4°C	storage in refrigerating room
-20°C	storage in deep-freeze room
®	registered symbol, registered trade mark
	corrosive
	explosive
 /  +	highly flammable / extremely flammable
	fire-activating, oxidizing
 /  +	toxic / very toxic
 n	harmful
 i	irritant
	dangerous for the environment
	GHS01 exploding bomb
	GHS02 flame
	GHS03 flame over circle
	GHS04 gas cylinder
	GHS05 corrosion
	GHS06 skull and crossbones
	GHS07 exclamation mark
	GHS08 health hazard
	GHS09 environment
Å	Ångström = 10^{-10} m
ACS	American Chemical Society
ADR	European agreement on international road transport of hazardous goods
AW	atomic weight
Amp.	ampoule
aq	water
art.	artificial
asym.	asymmetrical
AT	argentometric titration
BP	British Pharmacopoeia
bp	boiling point, boiling range
bp_{12}	boiling point at 12 torr
c	amount-of-substance concentration
CAS	Chemical Abstract Service
CELLPURE®	suitable for cell culture
CHR	A compound in this catalogue is designated as being thin-layer chromatographically pure (CHR) if no impurities can be detected during test conditions with 20 µg sample.
~CHR	For products with impurities which under our conditions, (see CHR), allow the main compound to be designated; such products can be identified as being "almost thin-layer chromatographically pure" (~CHR).
C.I. No	colour index number
conc.	concentrated
cP	centipoise
cryst.	crystallized
cSt	centistoke
D	density
DAB	Deutsches Arzneibuch (German Pharmacopoeia)
DAC	Deutscher Arzneimittel-Codex (German Drugs Codex)
DC	thin-layer chromatography
dec.	decomposition
depur.	depuratum, purified quality
dest.	distilled
DIN	German Industrial Standards
E No	number codes for food additives that have been assessed for use within the EC
EC No	the official number of a chemical substance that is commercially available within the EC
extra pure	suitable for laboratory use
F	melting point, melting range
FCC	Food chemical codex
FIP	Fédération Internationale Pharmaceutique
Flp	flash point
g	gramme
GC	gas chromatography
(GC)	content defined by gas chromatography
H	Hazard statement acc. to regulation (EC) No 1272/2008 (CLP, GHS)
HPLC	high performance liquid chromatography
IE	international unit (Internationale Einheit)
ISO	International Organization for Standardization
IU	international unit
JP	Japanese Pharmacopoeia
kg	kilogramme
l, ltr	litre
Lit.	literature
LSC	liquid scintillation counting
lyophil.	lyophilized (readily soluble form)
M or mol/l	molarity, amount-of-substance concentration

Abbreviations and Symbols

M	molecular weight or molar mass
mg	milligramm
ml	mililitre
Mol.%	molar percent
nat.	natural
n_D	refractive index
o.r.	on request
P	Precautionary statement acc. to regulation (EC) No 1272/2008 (CLP, GHS)
Pa s	Pascal second
p.a.	pro analysi = for analytical purposes
Pestilyse®	solvent, suitable for residue analysis (environmental, water and food analysis)
pH	pH value
pKa	pKa value
pharm.	pharmaceutical quality, for pharmaceutical purposes
Ph.Eur.	European Pharmacopoeia
ppb	parts per billion = 1 µg per kg
ppm	parts per million = 0,0001 %, 1 mg per kg
ppt	parts per trillion = 1 ng per kg
prim.	primary
PUFFERAN®	can be used as buffer
pulv.	pulverised
pure	suitable for synthesis and laboratory use
puriss.	purissimum, especially pure quality. Products with such designation have a content of at least 99%, unless a different content is stated in %. Their appearance and characteristic data correspond to the appertaining literature or deviate only slightly from it. They are suitable for purposes requiring a high degree of purity. With a number of products having this degree of purity, analysis certificates plus guarantee will be supplied or attached to the container. Delicate products are packaged under protective gas.
purum	chemically pure quality. Products having the purity designation "purum" have a content of at least 97%, unless a different content is stated, and their colour and characteristic data, apart from minor deviations, correspond to the literature. This degree of purity is recommended for laboratory work such as syntheses, which are subject to purity requirements. Delicate products are packaged under protective gas.
R	Risk statement acc. to regulation 67/548/EEC
rect.	rectification
redest.	redistilled
resubl.	resublimated
ROTICHROM®	suitable as standard in chromatography
ROTICHROM®GC	reference substance for gas chromatography, delivered with GC chromatogram
ROTICHROM®HPLC	reference substance for HPLC, delivered with HPLC chromatogram
ROTICHROM®TLC	reference substance for thin-layer chromatography, delivered with thin-layer chromatogram
ROTICUBE®	Combi-box of 5 litre or 10 litre, consisting of a stable outer card box with inner bag made of PE; comes with stopcock.
ROTIDRY®	dried solvents, filled under protective gas
ROTIDRY®SEPT	dried solvents, in a septum bottle
ROTIGEN®	product is suitable for DNA-synthesis
ROTIPHORESE®	product is suitable for electrophoresis
ROTIPURAN®	highly pure product
ROTISOLV®	solvent for specific use - brand name Roth
ROTITAINER®	Stackable containers which can also be handled easily by female workers. Matching safety pumps are available. Solid substances are delivered in plastic buckets.
S	Safety statement acc. to regulation 67/548/EEC
sec.	secondary
sicc.	dry, anhydrous (siccus)
sine H_2O	water free
stab.	stabilized
subl.	sublimated
sym.	symmetrical
synth.	synthetic
techn.	technical quality. Products with the purity designation "technicum" feature a different content. They are generally mass produced and may have a slightly foreign odour and colour. They are used for general technical purposes.
tert.	tertiary; standard for thin-layer chromatograhy (TLC)
TLC	thin layer chromatography
U	unit
USP	United States Pharmacopoeia
WGK	water hazard class
WGK 1	generally not water hazardous
WGK 2	water hazardous
WGK 3	extremely water hazardous

Labelling acc. to Regulation 67/548/EEC

Symbols		Risk-phrases	Safety-phrases
 **T+**	Very toxic	**26, 27, 28**, 39	1, 4, 13, 20, 21, 22, 27, 28, 29, 35, 36, 37, 38, 45
 **T**	Toxic	**23, 24, 25**, 39, 45, 46, 48, 49, 60, 61	1, 4, 13, 20, 21, 22, 27, 28, 35, 36, 37, 38, 45
 **Xn**	Harmful	**20, 21, 22**, 40, 42, 46, 48, 60, 61, 62, 63, 64, 65, 68	2, 13, 36, 37, 45
 **C**	Corrosive	**34, 35**	2, 18, 20, 25, 26, 27, 28, 37, 39, 45
 **Xi**	Irritant	**36, 37, 38**, 41, 43	2, 18, 24, 25, 26, 27, 28, 37, 39, 45
 **E**	Explosive	**1, 2, 3**, 4, 5, 6, 16	1, 2, 3, 4, 35, (7, 9, 14, 25, 27, 39, 50)
 **O**	Oxidizing	**7, 8, 9**	2, 14, 25, 40, 50
 **F+**	Extremely flammable	**12**	2, 3, 9, 15, 16, 29, 33, 43
 **F**	Highly flammable	**11**, 15, 17	2, 3, 9, 16, 29, 33
 **N**	Dangerous for the environment	50, 51, 52, 53, 54, 55, 56, 57, 58, 59	29, 56, 57, 59, 60, 61

R+S-Phrases

R-Phrases

R 1:	Explosive when dry.
R 2:	Risk of explosion by shock, friction, fire or other sources of ignition.
R 3:	Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R 4:	Forms very sensitive explosive metallic compounds.
R 5:	Heating may cause an explosion.
R 6:	Explosive with or without contact with air.
R 7:	May cause fire.
R 8:	Contact with combustible material may cause fire.
R 9:	Explosive when mixed with combustible material.
R 10:	Flammable.
R 11:	Highly flammable.
R 12:	Extremely flammable.
R 14:	Reacts violently with water.
R 15:	Contact with water liberates extremely flammable gases.
R 16:	Explosive when mixed with oxidizing substances.
R 17:	Spontaneously flammable in air.
R 18:	In use, may form flammable/explosive vapour air mixture.
R 19:	May form explosive peroxides.
R 20:	Harmful by inhalation.
R 21:	Harmful in contact with skin.
R 22:	Harmful if swallowed.
R 23:	Toxic by inhalation.
R 24:	Toxic in contact with skin.
R 25:	Toxic if swallowed.
R 26:	Very toxic by inhalation.
R 27:	Very toxic in contact with skin.
R 28:	Very toxic if swallowed.
R 29:	Contact with water liberates toxic gas.
R 30:	Can become highly flammable in use.
R 31:	Contact with acids liberates toxic gas.
R 32:	Contact with acids liberates very toxic gas.
R 33:	Danger of cumulative effects.
R 34:	Causes burns.
R 35:	Causes severe burns.
R 36:	Irritating to eyes.
R 37:	Irritating to respiratory system.
R 38:	Irritating to skin.
R 39:	Danger of very serious irreversible effects.
R 40:	Limited evidence of a carcinogenic effect.
R 41:	Risk of serious damage to eyes.
R 42:	May cause sensitization by inhalation.
R 43:	May cause sensitization by skin contact.
R 44:	Risk of explosion if heated under confinement.
R 45:	May cause cancer.
R 46:	May cause heritable genetic damage.
R 48:	Danger of serious damage to health by prolonged exposure.
R 49:	May cause cancer by inhalation.
R 50:	Very toxic to aquatic organisms.
R 51:	Toxic to aquatic organisms.
R 52:	Harmful to aquatic organisms.
R 53:	May cause long-term adverse effects in the aquatic environment.
R 54:	Toxic to flora.
R 55:	Toxic to fauna.
R 56:	Toxic to soil organisms.
R 57:	Toxic to bees.
R 58:	May cause long-term adverse effects in the environment.
R 59:	Dangerous for the ozone layer.
R 60:	May impair fertility.
R 61:	May cause harm to the unborn child.
R 62:	Possible risk of impaired fertility.
R 63:	Possible risk of harm to the unborn child.
R 64:	May cause harm to breastfed babies.
R 65:	Harmful: may cause lung damage if swallowed.
R 66:	Repeated exposure may cause skin dryness or cracking.
R 67:	Vapours may cause drowsiness and dizziness.
R 68:	Possible risk of irreversible effects.

Combination of R-Phrases

R14/15:	Reacts violently with water, liberating extremely flammable gases.
R 15/29:	Contact with water liberates toxic, extremely flammable gas.
R 20/21:	Harmful by inhalation and in contact with skin.
R 20/22:	Harmful by inhalation and if swallowed.
R 20/21/22:	Harmful by inhalation, in contact with skin and if swallowed.
R 21/22:	Harmful in contact with skin and if swallowed.
R 23/24:	Toxic by inhalation and in contact with skin.
R 23/25:	Toxic by inhalation and if swallowed.
R 23/24/25:	Toxic by inhalation, in contact with skin and if swallowed.
R 24/25:	Toxic in contact with skin and if swallowed.
R 26/27:	Very toxic by inhalation and in contact with skin.
R 26/28:	Very toxic by inhalation and if swallowed.
R 26/27/28:	Very toxic by inhalation, in contact with skin and if swallowed.
R 27/28:	Very toxic in contact with skin and if swallowed.
R 36/37:	Irritating to eyes and respiratory system.
R 36/38:	Irritating to eyes and skin.
R 36/37/38:	Irritating to eyes, respiratory system and skin.
R 37/38:	Irritating to respiratory system and skin.
R 39/23:	Toxic : danger of very serious irreversible effects through inhalation.
R 39/24:	Toxic : danger of very serious irreversible effects in contact with skin.

R+S-Phrases

R 39/25:	Toxic : danger of very serious irreversible effects if swallowed.
R 39/23/24:	Toxic : danger of very serious irreversible effects through inhalation and in contact with skin.
R 39/23/25:	Toxic : danger of very serious irreversible effects through inhalation and if swallowed.
R 39/24/25:	Toxic : danger of very serious irreversible effects in contact with skin and if swallowed.
R 39/23/24/25:	Toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R 39/26:	Very toxic : danger of very serious irreversible effects through inhalation.
R 39/27:	Very toxic : danger of very serious irreversible effects in contact with skin.
R 39/28:	Very toxic : danger of very serious irreversible effects if swallowed.
R 39/26/27:	Very toxic : danger of very serious irreversible effects through inhalation and in contact with skin.
R 39/26/28:	Very toxic : danger of very serious irreversible effects through inhalation and if swallowed.
R 39/27/28:	Very toxic : danger of very serious irreversible effects in contact with skin and if swallowed.
R 39/26/27/28:	Very toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
R 42/43:	May cause sensitization by inhalation and skin contact.
R 48/20:	Harmful : danger of serious damage to health by prolonged exposure through inhalation
R 48/21:	Harmful : danger of serious damage to health by prolonged exposure in contact with skin.
R 48/22:	Harmful : danger of serious damage to health by prolonged exposure if swallowed.
R 48/20/21:	Harmful : danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R 48/20/22:	Harmful : danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R 48/21/22:	Harmful : danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R 48/20/21/22:	Harmful : danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R 48/23:	Toxic : danger of serious damage to health by prolonged exposure through inhalation.
R 48/24:	Toxic : danger of serious damage to health by prolonged exposure in contact with skin.
R 48/25:	Toxic : danger of serious damage to health by prolonged exposure if swallowed.
R 48/23/24:	Toxic : danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
R 48/23/25:	Toxic : danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R 48/24/25:	Toxic : danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
R 48/23/24/25:	Toxic : danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R 50/53:	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 51/53:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 52/53:	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 68/20:	Harmful : possible risk of irreversible effects through inhalation.
R 68/20/21:	Harmful : possible risk of irreversible effects through inhalation and in contact with skin.
R 68/20/21/22:	Harmful : possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.
R 68/20/22:	Harmful : possible risk of irreversible effects through inhalation and if swallowed.
R 68/21:	Harmful : possible risk of irreversible effects in contact with skin.
R 68/21/22:	Harmful : possible risk of irreversible effects in contact with skin and if swallowed.
R 68/22:	Harmful : possible risk of irreversible effects if swallowed.

S-Phrases

S1:	Keep locked up.
S2:	Keep out of the reach of children.
S3:	Keep in a cool place.
S4:	Keep away from living quarters.
S5:	Keep contents under ... (appropriate liquid to be specified by the manufacturer).
S6:	Keep under ...(inert gas to be specified by the manufacturer).
S7:	Keep container tightly closed.
S8:	Keep container dry.
S9:	Keep container in a well-ventilated place.
S12:	Do not keep the container sealed.
S13:	Keep away from food, drink and animal feeding stuffs.
S14:	Keep away from ... (incompatible materials to be indicated by the manufacturer).
S15:	Keep away from heat.
S16:	Keep away from sources of ignition - No smoking.
S17:	Keep away from combustible material.
S18:	Handle and open container with care.
S20:	When using do not eat or drink.
S21:	When using do not smoke.
S22:	Do not breathe dust.
S23:	Do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the manufacturer).
S24:	Avoid contact with skin.
S25:	Avoid contact with eyes.
S26:	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S27:	Take off immediately all contaminated clothing.
S28:	After contact with skin, wash immediately with plenty of ... (to be specified by the manufacturer).

Classification & Labelling acc. to (EC) 1272/2008

Hazard Pictograms

The hazard pictogram on the designation label indicates the main hazard arising from a substance. If there are several hazardous qualitiies, several symbols are necessary.

Each pictogram is allocated a hazard designation and coding that do **not** appear on the designation label.

GHS01
exploding bomb

GHS02
flame

GHS03
flame over circle

GHS04
gas cylinder

GHS05
corrosion

GHS06
skull and crossbones

GHS07
exclamation mark

GHS08
health hazard

GHS09
environment

Hazard Statements H Codes

Hazard statements for physical hazards

H200	Unstable explosives.
H201	Explosive; mass explosion hazard.
H202	Explosive, severe projection hazard.
H203	Explosive; fire, blast or projection hazard.
H204	Fire or projection hazard.
H205	May mass explode in fire.
H220	Extremely flammable gas.
H221	Flammable gas.
H222	Extremely flammable aerosol.
H223	Flammable aerosol.
H224	Extremely flammable liquid and vapour.j
H225	Highly flammable liquid and vapour.
H226	Flammable liquid and vapour.
H228	Flammable solid.
H229	Pressurised container: May burst if heated.
H230	May react explosively even in the absence of air.
H231	May react explosively even in the absence of air at elevated pressure and/or temperature.
H240	Heating may cause an explosion.
H241	Heating may cause a fire or explosion.
H242	Heating may cause a fire.
H250	Catches fire spontaneously if exposed to air.
H251	Self-heating; may catch fire.
H252	Self-heating in large quantities; may catch fire.
H260	In contact with water releases flammable gases which may ignite spontaneously.
H261	In contact with water releases flammable gases.
H270	May cause or intensify fire; oxidiser.
H271	May cause fire or explosion; strong oxidiser.
H272	May intensify fire; oxidiser.
H280	Contains gas under pressure; may explode if heated.
H281	Contains refrigerated gas; may cause cryogenic burns or injury.
H290	May be corrosive to metals.

Hazard statements for health hazards

H300	Fatal if swallowed.
H301	Toxic if swallowed.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H310	Fatal in contact with skin.
H311	Toxic in contact with skin.
H312	Harmful in contact with skin.
H314	Causes severe skin burns and eye damage.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.

Classification & Labelling acc. to (EC) 1272/2008

Classification			Labelling			
Hazard class	**Category codes**		**Pictogram, code**	**Signal word**	**Hazard statements**	
Explosive	Unstable explosives	Unst. Expl.	 GHS01	Danger	H200	Unstable explosives.
	Divisions 1.1	Expl. 1.1			H201	Explosive; mass explosion hazard.
	Divisions 1.2	Expl. 1.2			H202	Explosive, severe projection hazard.
	Divisions 1.3	Expl. 1.3			H203	Explosive; fire, blast or projection hazard.
	Divisions 1.4	Expl. 1.4		Warning	H204	Fire or projection hazard.
	Divisions 1.5	Expl. 1.5	No pictogram	Danger	H205	May mass explode in fire.
	Divisions 1.6	Expl. 1.6	No pictogram, no signal word, no hazard statement			
Flammable gas	Category 1	Flam. gas 1	 GHS02	Danger	H220	Extremely flammable gas.
	Category 2	Flam. gas 2	No pictogram	Warning	H221	Flammable gas.
Flammable aerosol	Category 1	Flam. aerosol 1	 GHS02	Danger	H222	Extremely flammable aerosol.
	Category 2	Flam. aerosol 2		Warning	H223	Flammable aerosol.
Oxidising gas	Category 1	Ox. gas 1	 GHS03	Danger	H270	May cause or intensify fire; oxidiser.
Gas under pressure	Compressed gas	Press. gas	 GHS04	Warning	H280	Contains gas under pressure; may explode if heated.
	Dissolved gas					
	Liquefied gas					
	Refrigerated liquefied gas				H281	Contains refrigerated gas; may cause cryogenic burns or injury.
Flammable liquid	Category 1	Flam. Liq. 1	 GHS02	Danger	H224	Extremely flammable liquid and vapour.
	Category 2	Flam. Liq. 2			H225	Highly flammable liquid and vapour.
	Category 3	Flam. Liq. 3		Warning	H226	Flammable liquid and vapour.
Flammable solid	Category 1	Flam. Sol. 1		Danger	H228	Flammable solid.
	Category 2	Flam. Sol. 2		Warning		

Classification & Labelling acc. to (EC) 1272/2008

Classification			Labelling			
Hazard class	**Category codes**		**Pictogram, code**	**Signal word**	**Hazard statements**	
Skin corrosion/ irritation	Category 1A	Skin Corr. 1A	 GHS05	Danger	H314	Causes severe skin burns and eye damage.
	Category 1B	Skin Corr. 1B				
	Category 1C	Skin Corr. 1C				
	Category 2	Skin Irrit. 2	 GHS07	Warning	H315	Causes skin irritation.
Serious eye damage/ eye irritation	Category 1	Eye Dam. 1	 GHS05	Danger	H318	Causes serious eye damage.
	Category 2	Eye Irrit. 2	 GHS07	Warning	H319	Causes serious eye irritation.
Respiratory sensitization	Category 1 Category 1A Category 1B	Resp. Sens. 1 Resp. Sens. 1A Resp. Sens. 1B	 GHS05	Danger	H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Skin sensitization	Category 1 Category 1A Category 1B	Skin Sens. 1 Skin Sens. 1A Skin Sens. 1B	 GHS07	Warning	H317	May cause an allergic skin reaction.
Germ cell mutagenicity	Category 1A	Muta. 1A	 GHS08	Danger	H340	May cause genetic defects. (*)
	Category 1B	Muta. 1B				
	Category 2	Muta. 2		Warning	H341	Suspected of causing genetic defects. (*)
Carcinogenicity	Category 1A	Carc. 1A		Danger	H350 H350i	May cause cancer. (*) May cause cancer by inhalation.
	Category 1B	Carc. 1B				
	Category 2	Carc. 2		Warning	H351	Suspected of causing cancer. (*)
	(*) state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard					
Reproductive toxicity	Category 1A	Repr. 1A	 GHS08	Danger	H360 H360F H360D H360FD	May damage fertility or the unborn child. (*) May damage fertility. (*) May damage the unborn child. (*) May damage fertility. May damage the unborn child. (*)
	Category 1B	Repr. 1B				
	Category 2	Repr. 2		Warning	H361 H361f H361d H361fd	Suspected of damaging fertility or the unborn child. Suspected of damaging fertility. Suspected of damaging the unborn child. Suspected of damaging fertility. Suspected of damaging the unborn child.
	Additional category for effects on or via lactation	Lact.	No pictogram	No signal word	H362	May cause harm to breast-fed children.
	(*) state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard					